

CIE Technical Committee 2-17



Recommendations for Integrated Irradiance and Spectral Distribution of Simulated Solar Radiation

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TC 2-17 Document Status

- Publication CIE No. 20 (TC 2.2) - 1972
(now deprecated)
- Publication CIE No. 85 (TC 2.17) - 1989
“Solar Spectral Irradiance”
- First Draft: Part 2 “Solar Simulators for
Testing Purposes,” - no work in several
years

Solar Radiation Models - I

- BRITE Code - a Monte Carlo method of multiple, successive iterations (basis of ASTM E 891, E 892 & G 159 (all withdrawn or being withdrawn). Blättner et al, Bird et al (NREL)
- Line and Band Models
 - HITRAN - High Resolution Line Model accessed by FASCODE
 - MODTRAN - Moderate Resolution band model developed by AFOSR (0.102 nm resolution at 300 nm to 3 nm at 4000 nm)
 - LOWTRAN - Low resolution band model (AFOSR)
- Parameterization Models
 - SPECTRAL2 (Richard Bird, NREL)
 - SMARTS2 (Dr. Christian Gueymard) - Basis of ASTM G 173. Being placed into ISO TC 180 (Solar Energy) and IEC TC 85 (Photovoltaics) - Validated by spectroradiometric field measurements.

Solar Radiation Models - II



- Model used in CIE Publication No. 85 (origin not well documented)
- Other Models
 - VDI (Verein Deutscher Ingenieure) Calculation of Sun Radiation - Status unknown.
 - STAR (System for Transfer of Atmospheric Radiation) University of Tokyo and University of Munich collaboration. Status unknown.

CIE Publication No. 85



- Global Solar Irradiance agrees reasonably well with ASTM G173 (and with ASTM E892 and G159 - both of which have been withdrawn)
- Cannot be validated because the radiation code on which it is based is not readily available
- Deviates from SMARTS2 (and MODTRAN) in 500 - 700-nm region

Proposed Approach - Task I



- Re-compute Publication No. 85 on the basis of the SMARTS2 solar radiation code developed by Dr. Christian Gueymard
 - Re-compute using the atmospheric, geographical and geometric input parameters used to compute Publication No. 85
 - Re-issue Publication No. 85 under the rules established by CIE for such revisions

Proposed Approach - Task II



- Using the SMARTS2 radiation code, compute application-based reference spectra that the community of solar radiation and related technologies deem to be needed, or useful - e.g.,
 - building energy technologies for different climates (e.g., solar loading)
 - daylighting technologies
 - fenestration energy considerations
 - UV radiometer calibrations using reference spectra

Proposed Approach - Task III

- Continue the task begun in Part II of Publication No. 85 to construct tables to guide efforts to simulate solar radiation for various applications:
 - Completing Part II based on the SMARTS2 version of Publication No. 85
 - Initiate activities to construct tables as guides for simulation of solar radiation applications identified in Task II
 - It will be necessary to prioritize such work based on both need and the availability of experts